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RETRACTABLE PARCEL SHELF SYSTEM FOR A CONVERTIBLE
VEHICLE WITH A FOLDING ROOF

The invention relates to a retractable parcel shelf system for a convertible vehicle with a folding roof.

Such a retractable rear roof system is in itself known and comprises at least a panel and means for pivoting this panel about an axis transversal to the longitudinal axis (forward direction) of the vehicle. Thus, the panel moves from a normal operating position (typically a horizontal position) to a stored or retracted position inside a storage space in the vehicle which classically allows to also fold away the folding roof.

Traditionally, the storage space is composed of the rear boot of the vehicle which typically receives both the retractable panel and the folded roof.

When the parcel shelf system comprises a single-piece panel extending over the entire transversal length of the passenger compartment of the vehicle, the size of this panel could cause difficulties if the panel is to be put into the retracted position inside

the storage space, within an area of limited transversal dimensions located between the wheels.

For this reason in particular, we already know of parcel shelf systems comprising a central panel placed 5 on either side of the central panel and movable with respect to the latter. Means for displacement are furthermore envisaged to move the lateral panels with respect to the central panel, when the central panel is pivoted in either direction.

10 More precisely, the French application FR 02 05568 filed on 3 May 2002 under the applicant's name, discloses a retractable parcel shelf system comprising two lateral panels assembled so as to pivot about a substantially perpendicular axis to the upper surface 15 of the central panel and embodied so that each lateral panel, in the pivoted position, is substantially stored under the central panel, which is itself in its retracted position. This system comprises means for controlling the inward pivot movement of each of the 20 lateral panels with respect to the central panel whilst the central panel is pivoting from its normal position to its retracted position. Each of the lateral panels is controlled by the movement of the central panel via 25 a set of connecting rods which bear upon corresponding surfaces of the body of the vehicle or upon load bearing points fixed to the central panel. In the normal position, substantially horizontal, of the central panel, the lateral panels are retained in their deployed position via springs, irrespective of the 30 stored and folded or deployed and closed position of the roof.

In numerous cases, the rigid folding roof comprises on either side of the vehicle, irrespective of the type of folding roof, at least an arm whose lower end is pivot mounted onto the body of the vehicle 5 about an transversal axis of said vehicle.

When the roof is folded so as to move from its closed position, over the passenger compartment of the vehicle, to its stored position in the boot of the vehicle, each pivoting arm moves from a substantially 10 vertical position to a substantially horizontal position, which releases at each lateral end of the central panel an opening which is to be blanked off by the corresponding lateral panel. This is also the case for the corresponding back quarter light (or lateral 15 element of the rear section of the roof) equipped with internal fittings. This back quarter light, of reasonable thickness and whose fittings can often hide the aforementioned pivoting arms, or which can act as a pivoting arm, frees, when stored away in the boot with 20 the other parts of the roof, an opening which is to be blanked off.

The purpose of the invention is to propose a retractable parcel shelf system of simple design, inexpensive and reliable that controls the deploying of 25 the lateral panels when the central panel moves from its retracted position to its normal position although the roof is in its stored and folded position inside the boot of the vehicle, and the and the retraction of the lateral panels when the central panel pivots in the 30 opposite direction.

According to a beneficial alternative of the invention, the stop means are permanently manoeuvred towards the rear by elastic return means.

According to another beneficial alternative of the invention, the stop means are laid out at the free end of at least one arm assembled so as to pivot about a transversal axis of the body of the vehicle, and can be linked via a connecting rod to means for actuating the corresponding lateral panel.

According to an advantageous alternative of the invention, each lateral panel is assembled so as to pivot about a corresponding axis substantially perpendicular to the upper surface of the central panel. Each connecting rod is linked to the corresponding lateral panel via a spherical joint located with respect to said axis so that a relative forward displacement of each connecting rod with respect to the central panel pivots the corresponding lateral panel towards its deployed position.

Moreover, to obtain an efficient mechanical control of the parcel shelf system, it is also recommended that the movable stop is linked to a bar extending transversally with respect to the longitudinal axis of the vehicle and which it is attached to the chassis of the vehicle, and the central panel is assembled so as to pivot with respect to this bar, by means of at least a pair of articulated bars.

Preferably, the system comprises a stop linked to the aforementioned bar in order to control each lateral panel.

The system is thus made safe. Furthermore, the parcel shelf system thus constitutes a sub-unit which is attached to said bar and which can be assembled as such, onto a vehicle, this sub-unit being attached to 5 the vehicle via the fixation means of said bar.

According to another feature of the invention, it is advantageously envisaged that in the retracted position, the central panel and the lateral panels are tilted in a substantially vertical position and, during 10 this tilting, the connecting rod operates on the concerned articulated arm in order to put it into a substantially vertical position, so that the roof can pass by.

Thus, an appropriate space is created to allow the 15 roof to pass by.

Also to be note is that advantageously, in the normal operating position of the central panel (typically horizontal or substantially horizontal), although the roof is closed above the passenger 20 compartment of the vehicle, the concerned stop is manoeuvred towards the rear thanks to the return system and thus retains the lateral panels in a retracted position with respect to the central panel.

As previously indicated, the number of movements 25 of the lateral panels is limited and the speed of the folding manoeuvres of the roof is optimised (because the lateral panels are already retracted).

The invention also relates to a convertible vehicle with a rigid folding roof comprising a parcel 30 shelf system according to the first version of the invention.

A more detailed description of the invention follows with reference to the annexed drawings given by way of example and non-restrictive and in which:

- drawing 1 is a partial diagrammatic top view 5 of a convertible vehicle with a rigid folding roof capable of receiving a parcel shelf system according to the invention;
- drawing 2 diagrammatically shows the workings of the central panel and the lateral panels seen three 10 quarters to the rear corresponding to an embodiment of the parcel shelf system according to the invention;
- drawing 3 shows an enlarged localised view, seen three quarters to the underneath staring from the front, of the driving mechanism of one of the lateral 15 panels of the system in drawing 2;
- drawing 4 shows a part of the mechanism of the panels, when the roof is stored in the boot (convertible position), along a cross section made in the vertical plane 4 in drawing 3;
- 20 - drawing 5 is a localised side view (arrow V in drawing 3) of the mechanism of the panels when the roof is closed above the passenger compartment, and that the panels are retracted;
- drawing 6 shows a localised zone of the 25 central panel with, below, one of the lateral panels in the retracted position (seen in the direction of the arrow VI in drawing 5);
- drawing 7 shows, as in drawing 5, a side view of the mechanism of the panels when the panels tilt to 30 allow the roof to pass by.

In drawing 1, the embodiment shows a convertible vehicle 1 with a rigid folding roof 1a comprising a section of front roof 2 and a section of rear roof 3 which are movable with respect to the vehicle and one 5 with respect to the other in order to be folded respectively into positions 2a and 3a inside the boot 4 whose lid 5 can open from the front to the rear into position 5a to allow the sections of the roof to pass by. More than two sections or less than two sections 10 can be envisaged for the roof 1a. If, as is normally the case, the roof 1a has several sections, these sections are movable with respect to each other so as to articulate from a deployed position (substantially aligned above the passenger compartment) and a folded 15 position, stored in the boot 4 in a stacked state in drawing 1 (the rear section 3a having the front section 2a above it so that the two sections are placed substantially horizontally, one above the other).

Thus, when it is closed above the passenger 20 compartment (on the left in drawing 1), the roof 1a is stretched horizontally, whereas it is folded, in the boot, in its open state, stored in the boot (to the right in drawing 1; dotted lines 2a and 3a).

The vehicle 1 comprises a parcel shelf system 6 25 which is represented in drawing 1 by a continuous line, in its normal operating position, in this particular case substantially horizontal, and by dashes in its retracted position, in this example a substantially vertical position to the front of the boot.

30 As can be diagrammatically seen in drawing 2, the parcel shelf system comprises a central panel 7 and two

lateral panels 8a, 8b located on either side of the central panel, in the transversal direction 9 of the vehicle which in this instance is perpendicular to the longitudinal direction 100 (of forward direction) of 5 this vehicle.

The lateral panels 8a, 8b are movable in relation to the central panel 7 so as to take either a deployed position (drawing 2 or drawing 3 for the panel 8a) or retracted position in relation to it (drawing 6 or 7 of 10 the same lateral panel).

The parcel shelf system 6 comprises means for pivoting the central panel 7 in the two directions about at least one transversal axis (parallel to the transversal direction 9), from its normal substantially 15 horizontal position to a retracted position, stored inside the boot 4 and allowing to fold the two sections 2, 3 of the folding roof inside this boot.

The parcel shelf system 6 also comprises means for displacing the lateral panels 8a, 8b with respect to 20 the central panel 7.

Even if other systems could be envisaged for such a displacement (vertical tilting system for the lateral panels about lateral axes parallel to the axis 100, or a runner system allowing to slide the lateral panels in 25 relation to the central panel, parallel to the axis 9), it was envisaged in this instance that each of the lateral panels be assembled pivoting about an axis 10 (see drawing 3 for panel 8a) substantially perpendicular to the upper surface 11 of the central 30 panel 7. The axis 10 is fixed so that each of the

lateral panels 8a, 8b, in the retracted position, is substantially pivoted under the central panel 7.

The system 6 further comprises means for controlling the pivoting of each of the lateral panels 5 with respect to the central panel 7, in connection with the folding roof.

In some of the drawings, the markings AV and AR respectively define the front and rear sides of the concerned zones or of the vehicle itself (the front 10 being pointed in the forward direction of the vehicle). The arrow 12 shows the direction towards the inside of the vehicle, in the direction of the longitudinal axis 100 through which the longitudinal plane of symmetry of the vehicle passes, whereas the arrows 13 and 14 15 respectively schematise (in particular in drawing 3) the respective direction upwards and downwards.

As can be seen in particular in drawings 2 and 3, each of the lateral panels has, in the vicinity of its front inner corner 16, an extension 18 extending 20 transversally inwards (in the direction of the arrow 12), this being for the panel 8a in drawing 3 (under the central panel 7).

The extension 18 bears a pivot body capable of co-operating with a complementary coaxial pivot body fixed 25 under the central panel. Any one of these pivot bodies can be a male body, the other being a circular female body capable of surrounding the male body.

As can be seen in different drawings, the central panel 7 is, by means of at least one pair of arms 20, 30 22, articulated through tilting parallel to the axis 9 between a normal operating position, typically a

horizontal position, (see drawings 2 to 5) and a retracted position, typically a substantially vertical forward and downward tilted position (see drawing 7), for example against the front facing wall delimiting 5 the boot.

The central panel 7 preferably comprises two pairs of arms, respectively 20a, 20b; 22a, 22b in drawing 2. The arms 20a, 20b are linked together via a rigid transversal rail parallel to the axis 9.

10 The arms 20a, 22a; 20b, 22b of each pair are pivot assembled on an articulated part, respectively 26, 28 (drawing 2).

15 Each articulated part 26, 28 is solidly fixed to a transversal rod 30, parallel to the axis 9. The rod 30 is fixed to the vehicle, typically its chassis schematised by 34 in figures 4 and 5, by means of plates 32a, 32b extending substantially parallel to the axis 100 and located in the vicinity of lateral ends of the rod 30 (see drawing 2).

20 The arms of the two pairs 20, 22 are articulated, at their ends, along axes parallel to each other and to the transversal axis 9, respectively with respect to the panel 7 and in relation to the articulated parts 26, 28.

25 In order to ensure the tilting of the central panel, the rear arms 22a, 22b are longer than the front arms 20a, 20b and are arched so as to be longer horizontally compared to vertically. Furthermore, the four concerned zones of articulation (marked 36a, 36b 30 for the arm 20a, and 38a, 38b for the second

articulated arm 22a) are such that the rear point 38b is lower than the front point 36b.

Thus, if for example we compare drawings 4 and 7, we note that the panel 7 (and with it the lateral 5 panels, including the panel 8a) tilt via deformation of the malleable parallelograms constituted by the panel 7, the concerned fixed articulated part, such as 26, and the set of arms 20, 22.

The obtained retraction of the panel 7 is 10 typically controlled by an independent control system (not represented), such as a motor with a final drive shaft engaged with the panel.

The lateral panels 8a, 8b are each articulated towards the lateral ends of the panel 7, by means of a 15 connecting rod, 40a for the panel 8a, 40b for the panel 8b.

The retraction of the lateral panels in relation to the central panel being, in the considered example, performed via rotation about the axis 10 by means of 20 the aforementioned connecting rods and therefore being identical for the two panels, we will only describe the related mechanism for the panel 8a.

Thus, a front end of the connecting rod 40a is linked, in the vicinity of the zone 18, to the panel 8a 25 via a spherical joint 42. At the opposite end, the connecting rod 40a is articulated in rotation, about 44, with respect to an articulated stop 46, itself pivot assembled about 48 with respect to the plate 32a.

The axes of articulation of the zones 44, 48 are 30 parallel to the transversal axis 9 and respectively located towards the opposite ends of the stop 46 which

has an elongated shape, in the form of an arm, with towards the end of the zone 44, a nozzle 50 pointing towards the rear.

A return spring 52 (drawing 2) naturally displaces 5 the stop 46 towards the rear, and via the connecting rod 40a, 40b also displaces the corresponding lateral panel 8a, 8b in order to retain it in its retracted position in relation to the central panel, that being in the considered example rotated about the axis 10 so 10 as to be dissimulated under the central panel 7 (position of drawings 5, 6 and 7).

Given the above, we understand that in drawings 2, 3 and 4, the deployment of the lateral panels with respect to the central panel 7 was controlled by the 15 nozzle 50 of the stop 46 (or more precisely of each stop, as we recommend using a system thus designed for each lateral panel, as shown in drawing 2) which abutted and was stopped by a complementary body against the effect of the return system.

20 According to the invention, this displacing of the movable stops 46 which controls the deployment of the lateral panels is obtained via contact with a zone of the roof 1a, advantageously the front end (or front zone) 2a located to the front of the roof (see drawing 25 4).

This contact zone can be at the front of the front roof 2, if the folding of the roof (in this particular case its sections 2, 3) leads to this situation.

In figure 4, the protrusion 50 of the stop 46 30 penetrates into a retained 54 substantially in the shape of a quarter circle equipped with an upper lip 55

and located at the front end of the stored roof (in this instance the front section 2), for example designed to cover the transversal seal envisaged along the front edge (not represented) of the opening of the 5 roof.

In this position, the roof is open, that being folded into the boot 4, whereas the central panel 7 is in the normal operating position (in this instance the horizontal position), the manoeuvring of the stops 46 10 against the return system ensuring the lateral deployment of the panels 8a, 8b.

In the illustrations, we also note that when the vehicle is no longer in this convertible configuration (roof stored in the boot), each stop 46 is naturally 15 manoeuvred backwards by the return spring 52, so that the lateral panels are retracted (drawings 5, 6 and 7), which in particular frees a space allowing to displace the central panel from its normal operating position to its retracted position (tilted position in drawing 7), 20 facilitating the manoeuvring of the roof from its open roof position (convertible) to its closed roof above the passenger compartment 56 (drawing 1).

To change from the open roof position to that of the closed roof as in drawing 5 (where the lateral 25 panels are therefore retracted), we execute the intermediary stage in figure 7 which shows the central panel in its tilted position, remembering that the movement of the panel into this position implies the movement of the lateral panels into the same tilted 30 position in relation to the horizontal, given the linkages that exist between them.

Starting from the open and folded roof position in drawing 4, a means for controlling (not represented) drives the panel 7 forwards, which therefore makes it tilt via articulation about the arms 20, 22, in the 5 direction of the arrow 58.

Right from the start of the pivoting of the central panel 7, the stop arms 46 manoeuvred backwards by the spring 52 remain stationary in relation to the chassis of the vehicle, the nozzle 50 pushes against 10 the folded roof.

Each of the connecting rods 40a, 40b, immobilised by the corresponding stop arms 46, retains the corresponding spherical joint 42, which pivots the lateral panel 8a, 8b towards its retracted position 15 with respect to the central panel when the latter pivots.

When each lateral panel 8a, 8b attains its retracted position, the spherical joint 42 pulls the connecting rod 40a, 40b, and therefore the 20 corresponding stop arm 46 forwards against the effect of the return spring 52 as far as the end of the forward pivoting movement of the central panel 7 when the latter has attained its tilted position (drawing 7).

Advantageously, to facilitate the movement of the 25 roof, the stop arms 46 extend substantially vertically into the stored/tilted position of the panel 7, despite the forward pressure applied by the return spring 52 (see drawing 7).

The panels being in their retracted position in 30 drawing 7, the movement of the roof above them and the unfolding of this roof as far as its closed position

above the passenger compartment allow the central panel to return to its normal operating position as in drawing 5.

The concerned control means (hydraulic, electric, 5 etc.) thus in return ensure the tilting, via the arms 20, 22 of the panel 7 in the direction of the arrow 60 in drawing 5, until the panels return to their horizontal position. In this embodiment, the lateral panels remain retracted, folded under the central panel 10 when the roof does not apply any pressure on the stops.

In comparing drawings 4 and 5 we also note that the central panel 7 is, in the normal operating position, further forward in the direction of the vehicle in the closed position of the roof (drawing 5) 15 than it is in the stored and folded position of this roof (drawing 4).

As schematised in drawings 5 and 6, in the closed position of the roof, the lateral panels 8a, 8b are in their retracted position under the central panel 7 as 20 the nozzle 50 of the stop 46 did not meet with any obstacle during the pivoting of the central panel 7 from its retracted position towards its normal operating position corresponding to the closed position of the roof.

25 This further forward position towards the front of the central panel 7 is made necessary because, as schematised in drawing 6, the rear edge 7a of the central panel 7 must stop substantially before the front surface 300 of the rear lower edge 301 of the 30 rear section of roof 3 in the deployed position of the

roof 2, 3 above the passenger compartment 56 (see drawing 1).

In the stored and folded position of the roof in the boot of the vehicle, the central panel 7 can be in 5 its rear position in drawing 4 obstructing the opening freed by the rear lower edge 301 also stored in the boot.

We also note that an alternative to return systems other than the torsion spring 52 can be used to 10 manoeuvre and retain each stop 46 towards the rear, when there is no contact with the concerned zone of the roof. We can thus envisage a hydraulic jack or an arm coupled to an electric motor actuating the concerned stop.

15 The above is a description of lateral panels 8a, 8b, pivoting with respect to the central panel 7. We can also envisage lateral panels assembled so as to slide in a transversal direction of the vehicle. All that is required is to provide any known device 20 allowing to transform a longitudinal relative displacement of the connecting rod 40a, 40b into a transversal relative displacement of the corresponding lateral panel 8a, 8b.